

Black Soldier Fly meal and dehydrated larvae inclusion in shrimp diets : effects on growth and health performances



Christophe TRESPEUCH

MUTATEC, a historical and reference player in the European insect sector

A structuring precursor of the insect sector in Europe (member of IPIFF)

Since 2015, MUTATEC produces insect proteins for animal feed, with a **local and sustainable business model**

R&D Centre (insect nutrition and zootechnics, product quality and safety, applications)



Reference shareholders:
SEDE (VEOLIA Group)
and **LE GOUessant**

Since 2022, operates a **demonstrator industrial plant** in Cavillon (Vaucluse, FRANCE)

In the **Top 3 producers in France since 2018**, drawing the interest of main feed and petfood players

MUTATEC produces insect proteins in circular economy

Our farms rely on a **short and circular agricultural model**: reasonable size, inputs collected locally within 50 km from the farm.

Low carbon emitter

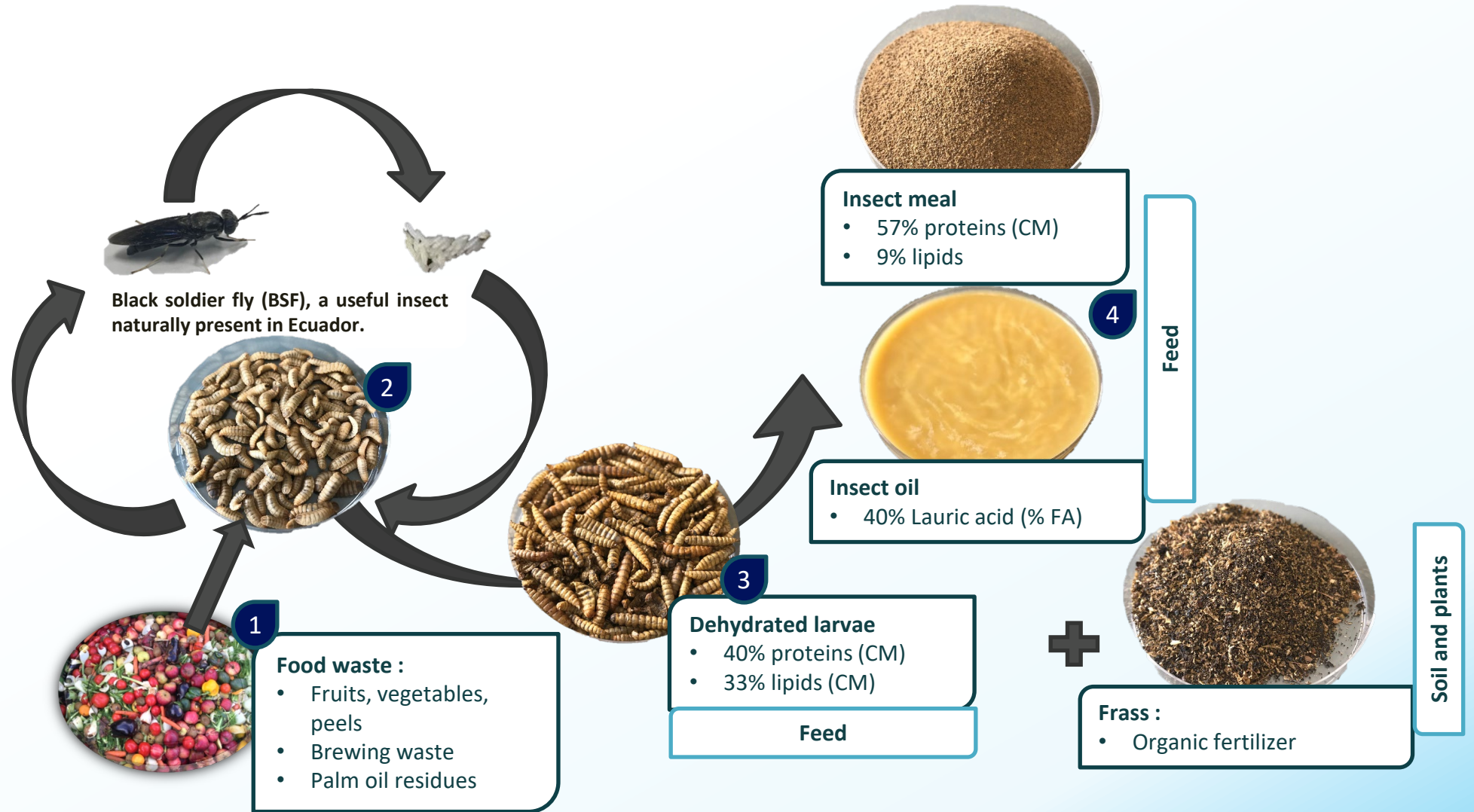
Unique **expertise** in the supply, preparation and blending of a wide range of agricultural and food losses to feed insects, thanks to the characteristics of the **Black Soldier Fly**.



Our model **addresses food losses** (30% of world's production), and **does not consume inputs usable for food production**

In 2023, MUTATEC valorized **3'700 tons** of food losses to produce 450 tons of insects, processed into Insect Meal, Insect Oil and whole popped dried larvae

Insects: how does it work?



Objectives and methods

Two questions :

- Are the insect products as good as fishmeal to feed shrimps ?
- Do the insect products add some value to the diet of shrimps ?

Three trials :

- 2 in Europe
- 1 in Ecuador

→ Growth performances & Bacterial challenge

Trial 1 – Belgium - 2020



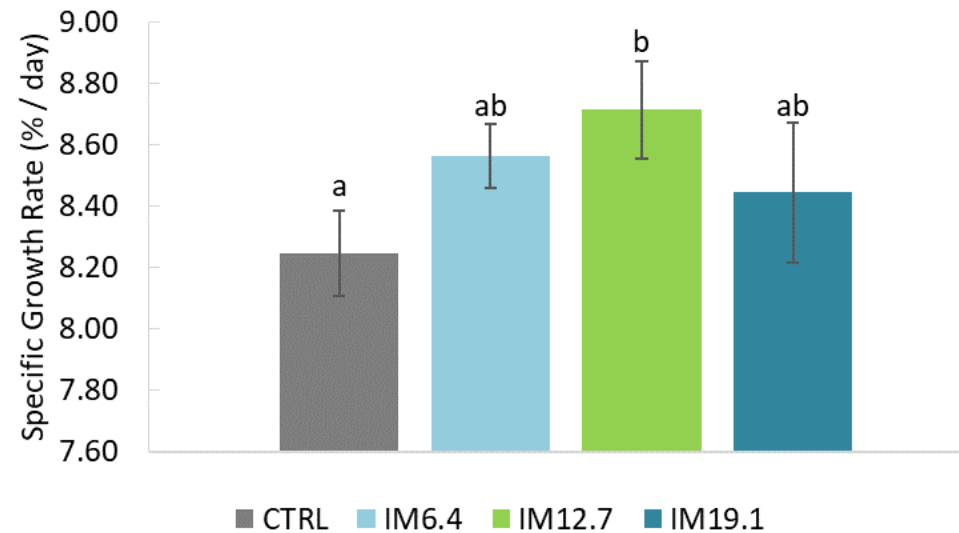
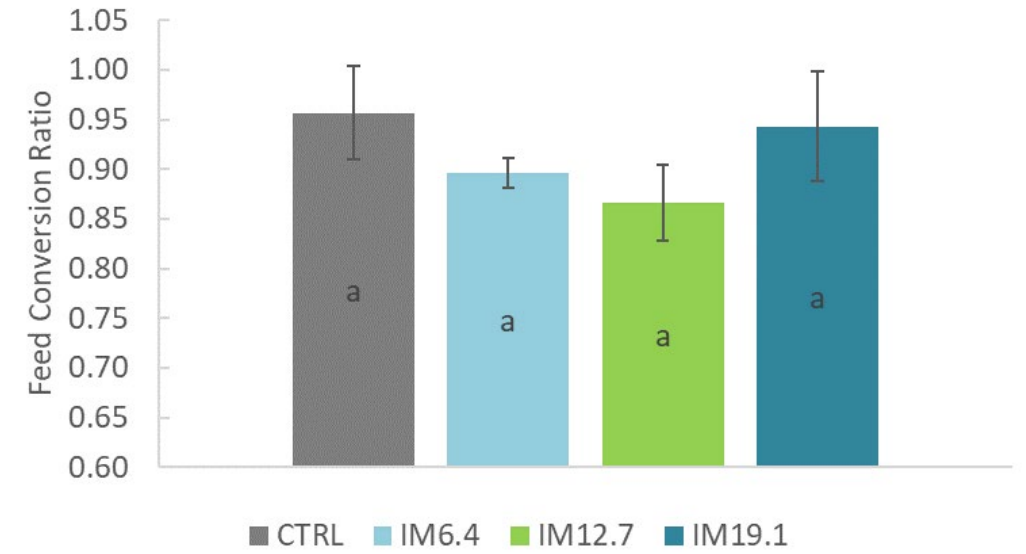
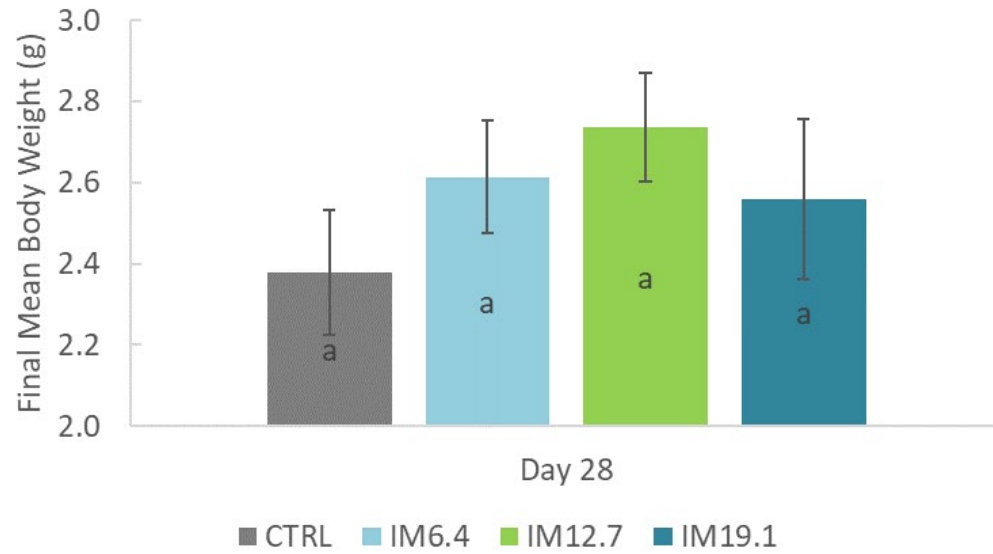
Diets and ingredients 2020	CTRL	IM6.4	IM12.7	IM19.1
Fishmeal	15.0%	10.0%	5.0%	0.0%
Insect meal (IM)	0.0%	6.4%	12.7%	19.1%
Fishmeal replacement rate	0%	33%	66%	100%

Isoproteic diets

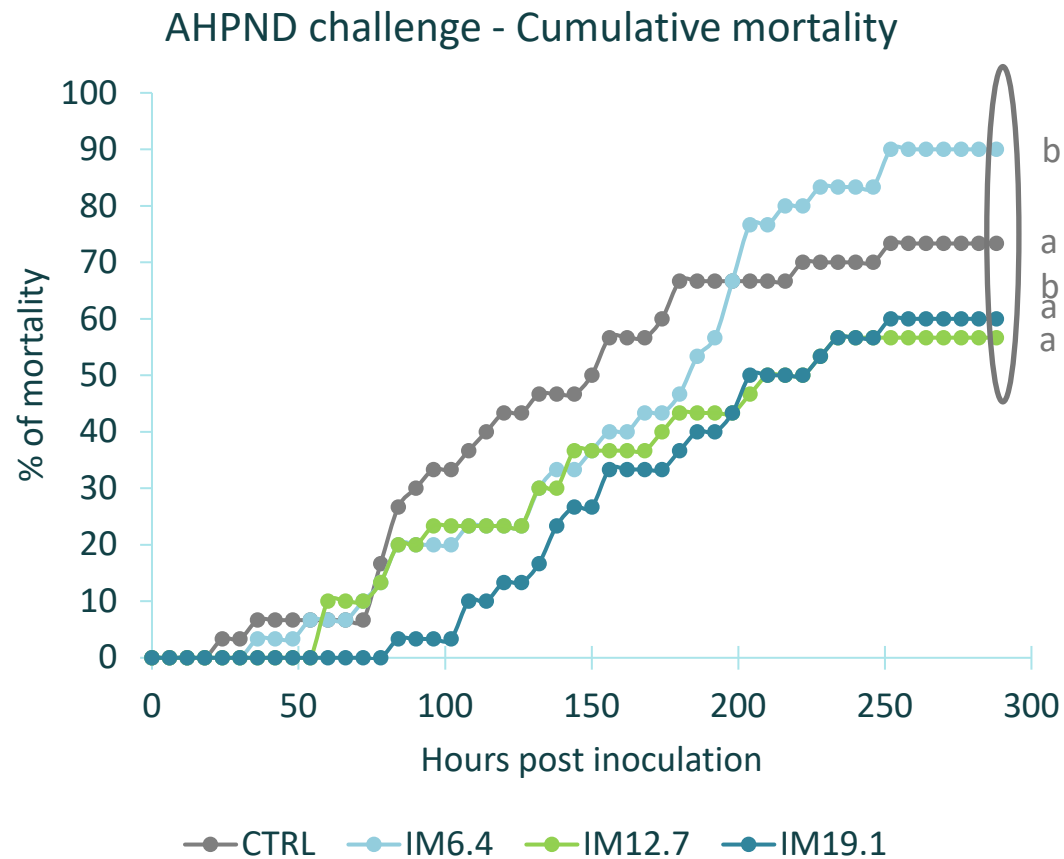
- Initial mean body weight = 0.24g
- Duration = 28 days
- 60 shrimps per replicate
- 290L tanks



Trial 1 – Belgium - 2020



Trial 1 – Belgium - 2020



AHPND Challenge

No significant difference in final mortality could be observed in any of the dietary treatments compared with the CTRL, although a **trend of decreased mortality** could be observed in the two highest inclusion rates of the BSF meal.

Trial 2 – Belgium - 2022



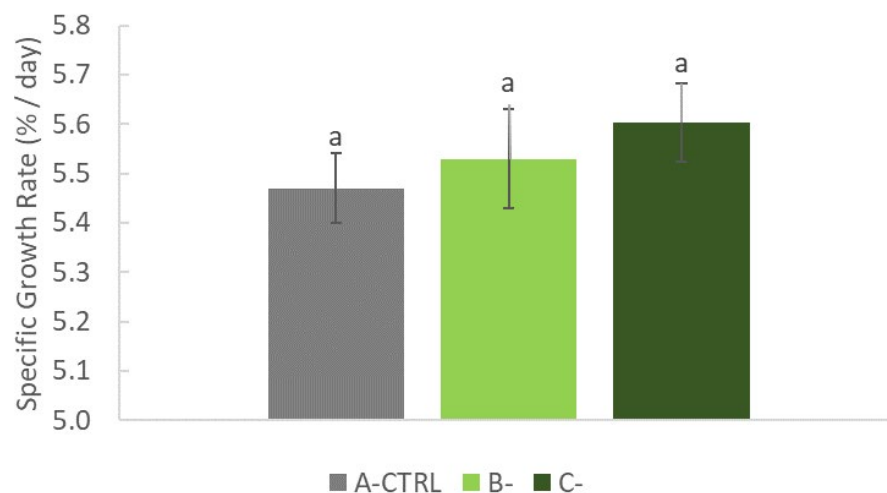
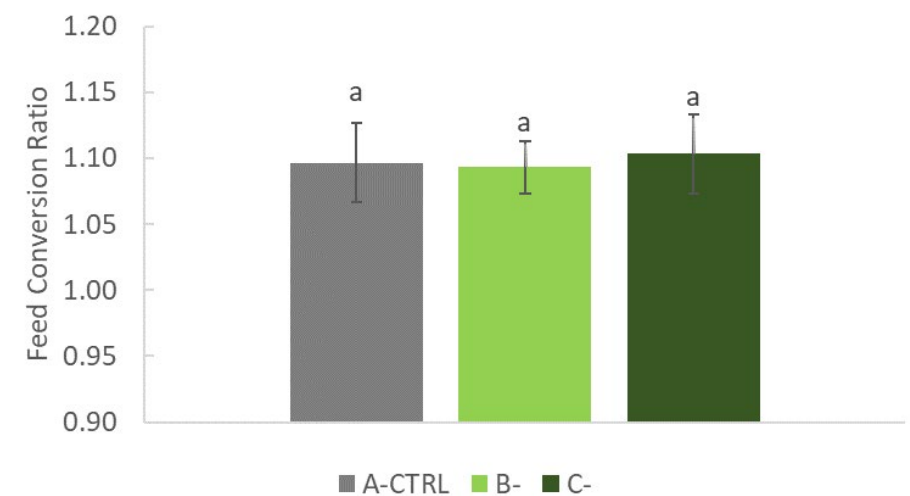
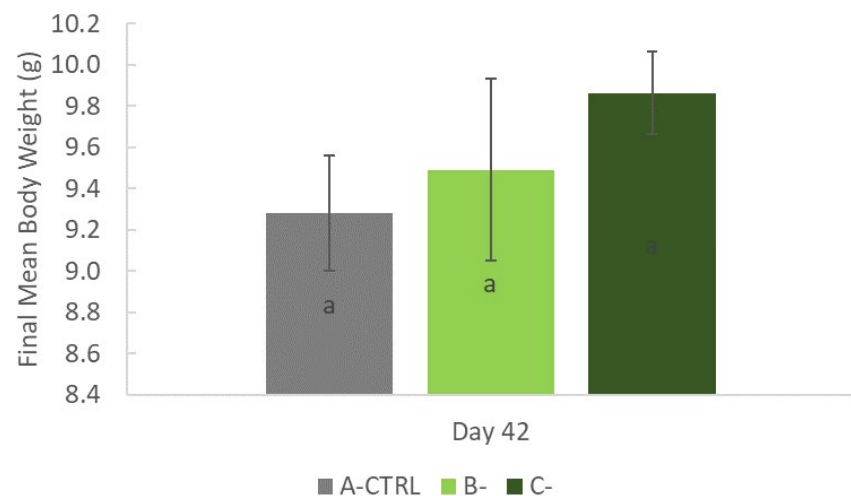
Diets and ingredients 2022	A_CTRL	B_	C_
Fishmeal	15.0%	5.0%	5.0%
Insect meal	0.0%	11.3%	11.5%
Fishmeal replacement rate	0%	66%	66%

Isoproteic diets

- Same inclusion level - 2 different batches
- Initial mean body weight = 0.93g
- Duration = 42 days
- 60 shrimps per replicate
- 290L tanks



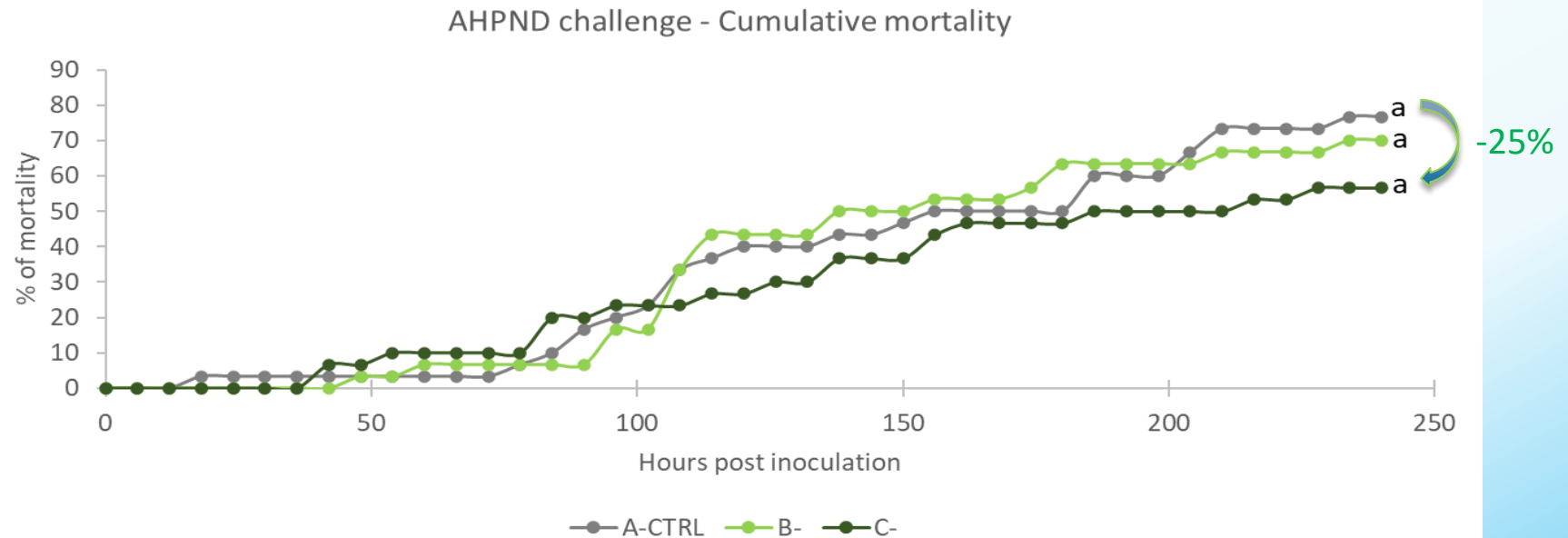
Trial 2 – Belgium - 2022



Trial 2 – Belgium - 2022

AHPND Challenge

- 77% mortality in A-CTRL vs 58% in C-
- Neutral impact of diets B-
- Trend of decreased mortality in treatment C- ($p=0.1838$)
- Inclusion of insect meal has potential to protect shrimp from AHPND-EMS



Trial 3 – Ecuador - 2023



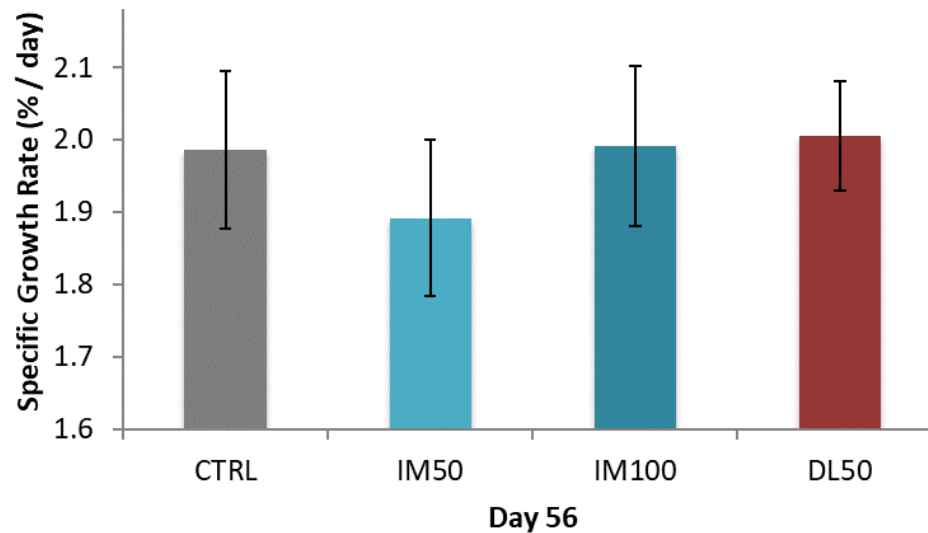
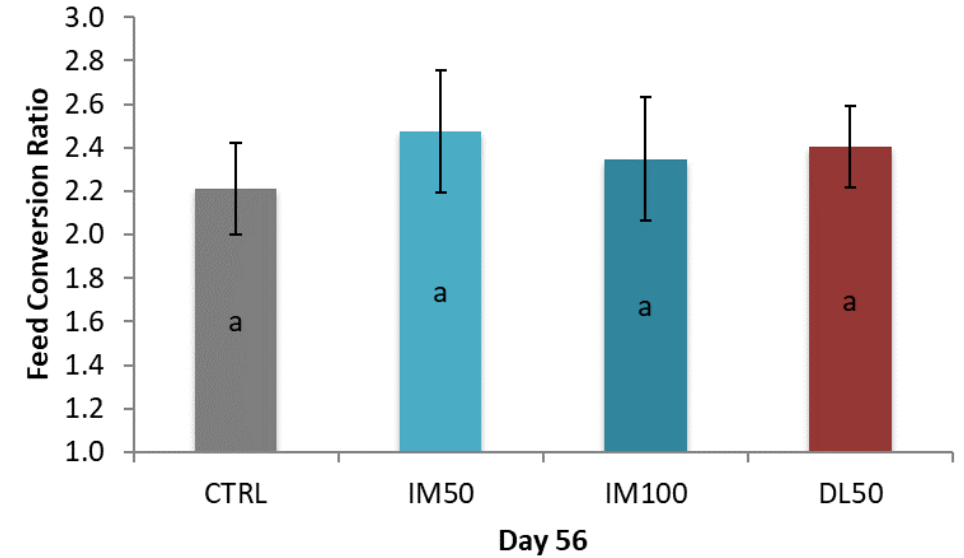
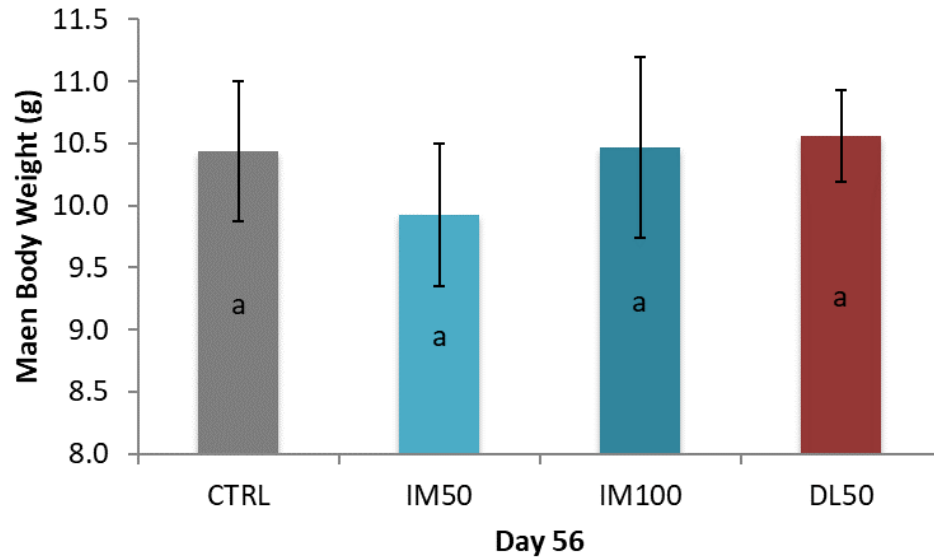
Diets and ingredients 2023	CTRL	IM50	IM100	DL50
Fishmeal	10.0%	5.0%		5.0%
Insect meal		5.8%	11.6%	
Dehydrated larvae				9.7%
Fishmeal replacement rate	0%	50%	100%	50%

Isoproteic diets

- Insect meal (IM) and dehydrated larvae (DL)
- Initial mean body weight = 3.4g
- Duration = 56 days
- 40 shrimps per replicate
- 1 000L tanks



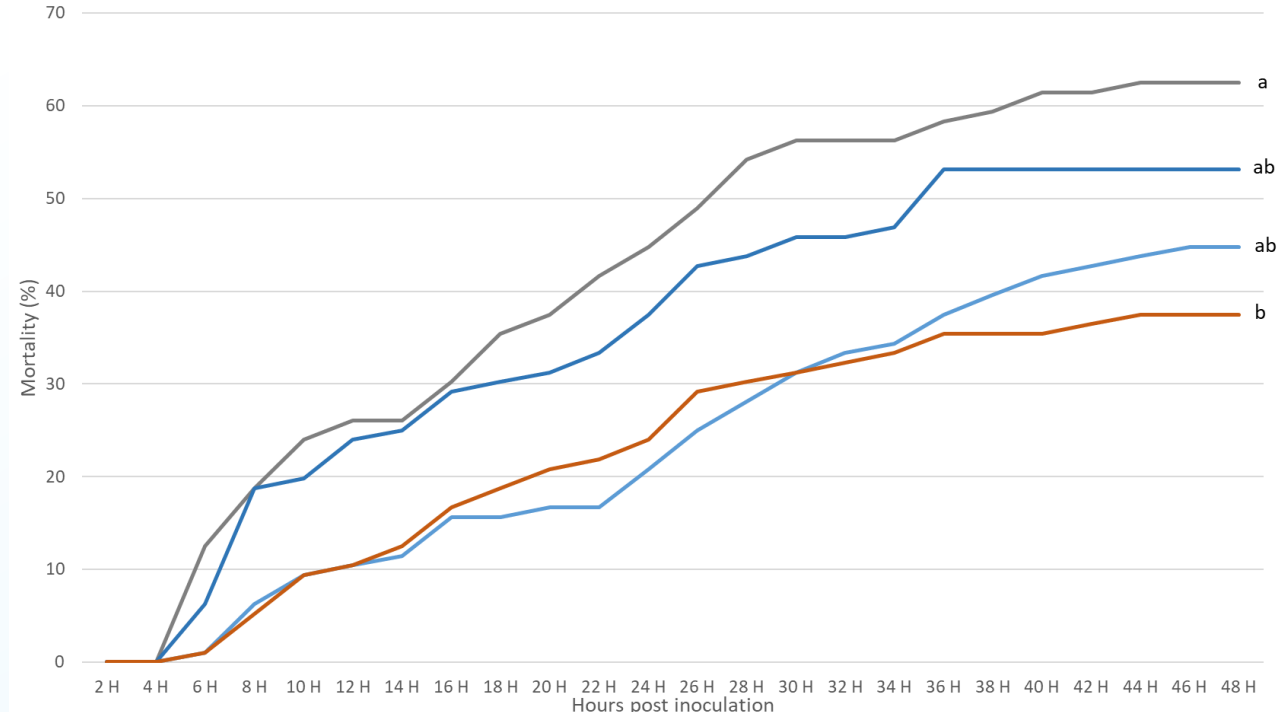
Trial 3 – Ecuador - 2023



Trial 3 – Ecuador - 2023

AHNPD Challenge

- 38% mortality in DL50 vs 63% in CTRL (significant)
- Trend of decrease mortality in IM50
- Inclusion of insect meal or dehydrated larvae has potential to protect shrimp from AHPND-EMS



Côme GUIDOU &
Christophe TRESPEUCH

Discussion



Growth results :

Adequate amino acid profile
Good palatability and digestibility
Good quality of insect meal (and dehydrated larvae) processes

- *Litopenaeus vannamei* (1.24g → 12.53g) – 63 days
- Similar survival and feed intake between treatments
- High palatability among diets
- Similar results between CTRL and the feed up to 25% of replacement of FM



Challenge results :

Antimicrobial Peptides
Lauric acid
Chitin

- Increased resistance to *Vibrio parahaemolyticus*
- Increased survival to *Vibrio penaeicida*

Conclusions



- Shrimps grow well (from 0.2g to 10.6g) with insects in their feed
- Challenge results suggest a potential to help shrimp to resist to AHPND-EMS
- Need to investigate the mode of action of insect products on the health of shrimps





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